Electro-Optical Systems

The last lecture of Weapons Class

What are we talking about?

- Optically guided weapons
- Night vision goggles
- Thermal Imaging
- Laser Guided Munitions

Electro-Optical Spectrum

- Electro-Optical Band 10^{11}-10^{16} Hz
- Visible ~10^{15} Hz
- Infrared ~10^{11}-10^{14} Hz

Sources

- Selective Emitters
  - Narrowband – many be only a couple Hz.
  - Only selective radiator we are interested in in Laser light.

Sources

- Thermal
  - Radiates in proportion to the absolute temperature (Kelvin).
  - Total power output is proportional to surface area.
  - Many military applications

Lasers

- Narrow bandwidth
- Can operate in CW or Pulse modes
- Many different types
- Can damage skin or eyes based on relative intensity.

Infrared

- Passive system that collects thermal radiation emitted from the target.
- Used in military and law enforcement applications.

Characteristics of Thermal Energy

- Uneven spreading
- Attenuation / Absorption
- Scattering

Detectors

- Aperture
- Bandwidth
- Range
- Field of View

Detector Range

- Depends on:
  - Attenuation due to atmosphere
  - Source level
  - Background levels
  - Detector sensitivity and bandwidth

Detector Performance

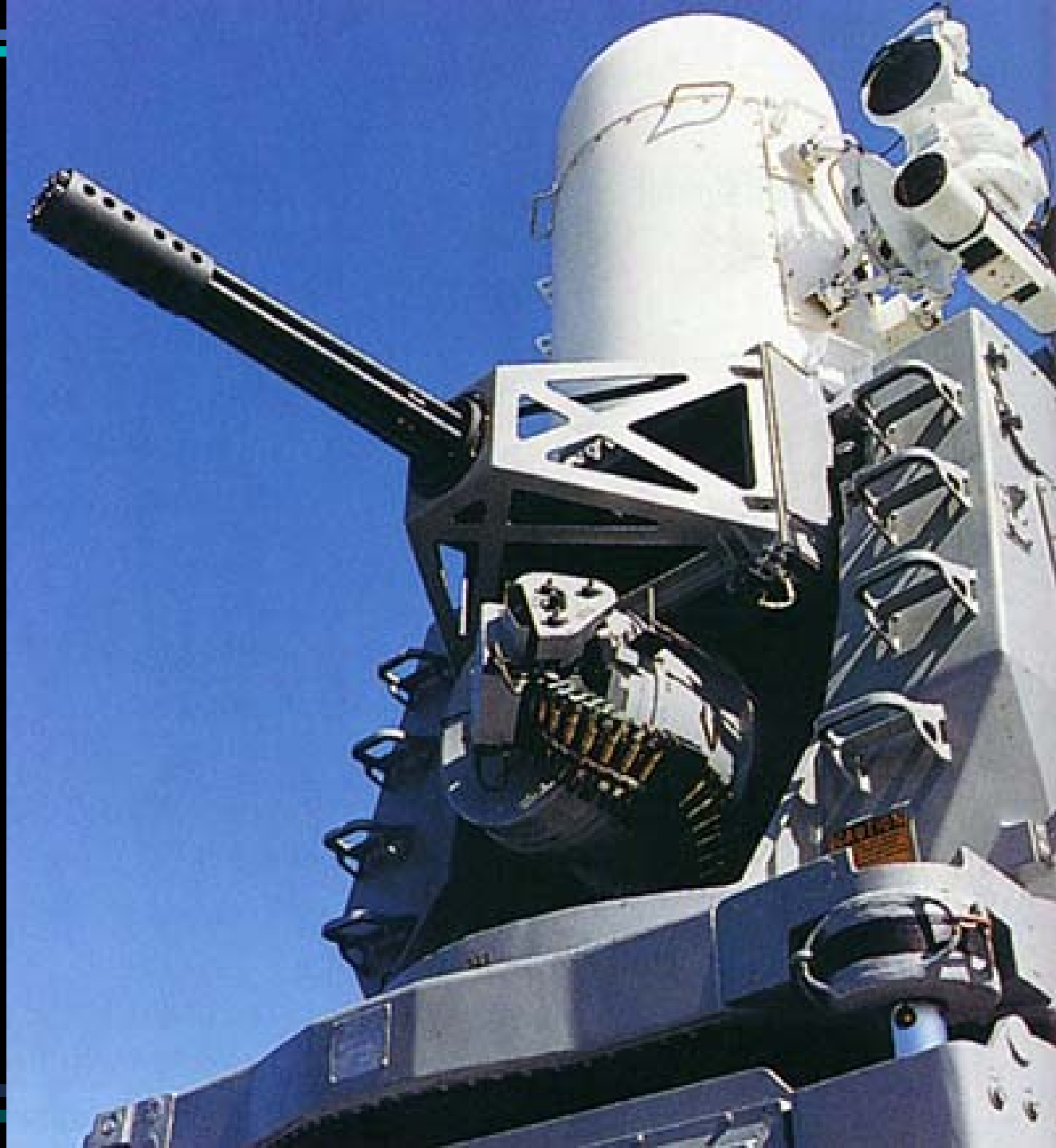
- Resolution
  - Spatial
    - Ability to distinguish small objects or parts of objects
  - Thermal
    - Ability to distinguish temperature differences
  - Spatial and Thermal resolution are inversely proportional.
  - Combined performance measure - MRTD

Military Uses

- Laser guided munitions
  - Designated from air or ground
- Thermal homing missiles
- Optical Guidance
- Night Vision

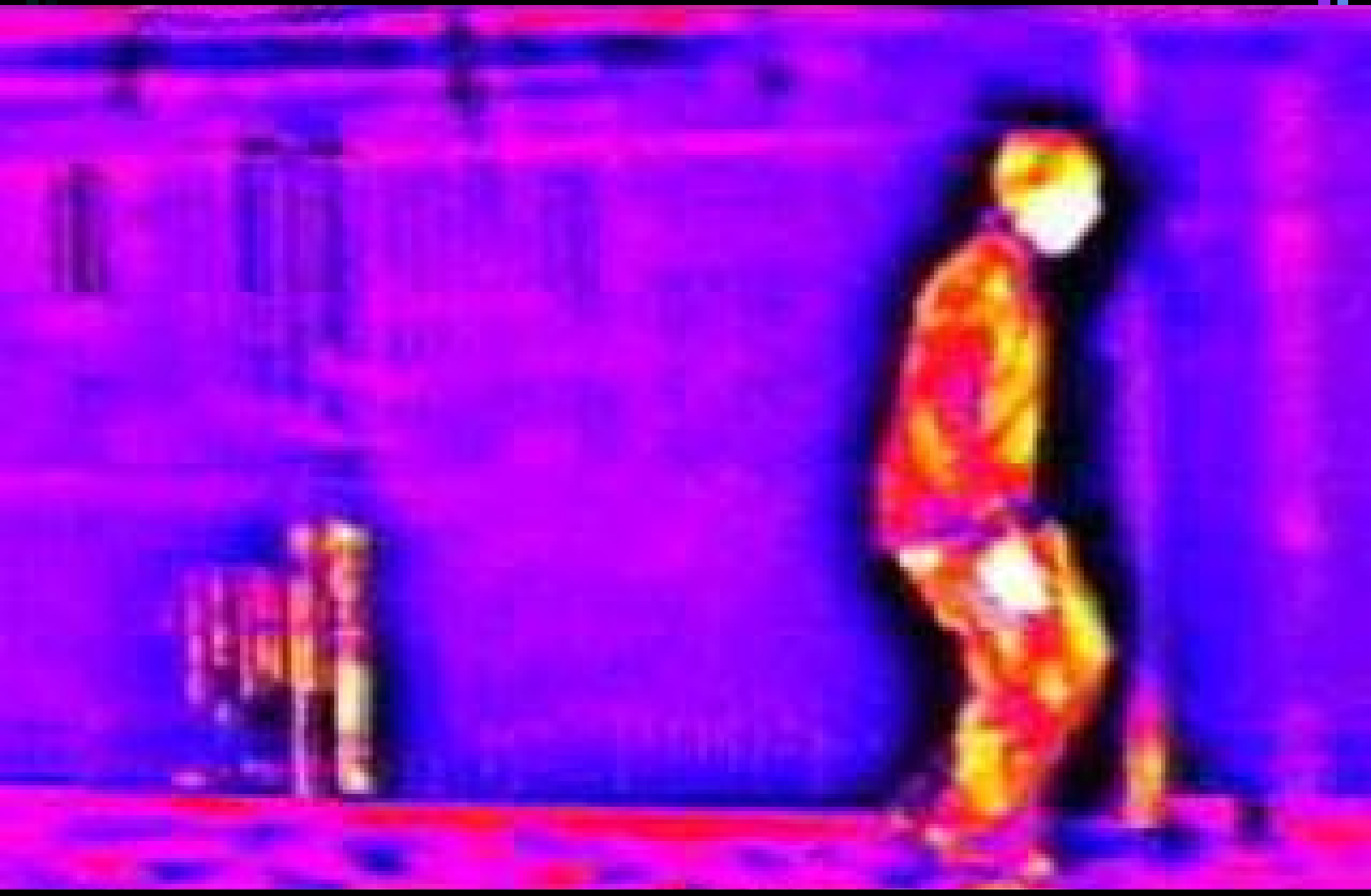
e Optics

CIWS Blk IIA



Thermal Imaging

MIDN Ricks dancing at the Mil Ball



Johnson, Williams, Porter, Boyle lookin’ for a party.....

Night Vision Goggles (NVG's)

LGB

TOW

Questions?